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ABSTRACT

This study sought to identify similarities and differences influencing students' self-perceived gains in communication and critical thinking skills. The study examined students' background characteristics and general college experiences, as well as their experiences in their major field of study. Structural equation modeling was used to examine the influence of disciplinary differences on self-perceived gains. The sample used for the study consisted of senior students (n=694) enrolled for the 1995-96 academic year at a midwestern research university. Students completed a self-report instrument designed to measure how college experiences influence educational success. The study found that contrary to expectations, students in multi-paradigm disciplines reported no greater gains in learning than students in single-paradigm disciplines. Also disappointing was the finding that advising had no substantial influence on any of the variables in the model. The study did find that student background characteristics implied distinct ways in which gender and academic aptitude were related to self-perceived gains. The study concludes that most important to student learning were high-quality experiences in the major and an environment conducive to academic and social integration. (Contains 42 references.) (CH)

Self-Perceived Gains in Communication and Critical Thinking Skills: Are There Disciplinary Differences?

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Dolores Vura
Editor
AIR Forum Publications

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ABSTRACT

The influence of disciplinary differences on self-perceived gains in critical thinking and communication skills were examined in terms of student background characteristics, experiences in the major, and college experience variables. Academic disciplines were categorized according to Biglan's (1973a) classification of single- and multiple-paradigm disciplines. While multi-group structural equation modeling showed no differences between self-perceived gains for single- and multiple-paradigm disciplines, the proposed theoretical model accounted for 25.3% and 13.5% of the variance in self-perceived communication and critical thinking skills, respectively. The variable most highly associated with self-perceived gains was the quality of lower-division courses in the major.

A university is a multi-faceted institution in which students are subjected to different sub-environments (Berdie, 1967). In his three-dimensional classification of academic subject matter, Biglan (1973a) made a distinction between single-paradigm (hard) and multiple-paradigm (soft) disciplines. In single-paradigm disciplines (i.e., chemistry, math, physics), all members subscribe to the same theoretical body of knowledge; in multiple-paradigm disciplines (i.e., education, history, psychology), members may subscribe to different bodies of theoretical knowledge (Biglan, 1973a). Although research has validated differences between the academic cultures of single- and multiple-paradigm disciplines, less research has been conducted which examines how disciplinary differences influence student learning. Using data from a single university, the purpose of this paper is to examine how disciplinary differences influence self-perceived gains in critical thinking and communication skills.

LITERATURE REVIEW

Differences between Single- and Multiple-Paradigm Disciplines

Empirical research has revealed and validated distinct differences between the characteristics of faculty in single- and multiple-paradigm disciplines. For example, on self-reports, faculty in single-paradigm disciplines rate themselves as more politically conservative and religious than faculty in multiple-paradigm disciplines (Smart & Elton, 1982). Faculty in single-paradigm disciplines have demonstrated greater commitment to research (Biglan, 1973b; Smart & Elton, 1982) than faculty in multiple-paradigm disciplines. In contrast, multiple-paradigm faculty have demonstrated more commitment to teaching (Biglan, 1973b) and administrative tasks (Smart & Elton, 1982) than single-paradigm faculty. Faculty in single-paradigm disciplines emphasize the learning of facts and concepts (Braxton, 1995; Smart & Ethington, 1995) whereas faculty in multiple-paradigm disciplines emphasize the development of higher order cognitive skills such as critical thinking (Braxton, 1995; Lattuca & Stark, 1995). Similarly, research has revealed that faculty in multiple-paradigm disciplines are more likely than faculty in single-paradigm

disciplines to value students' character development (Braxton, 1995; Smart & Elton, 1982), communication skills (Lattuca & Stark, 1995), and intellectual self-actualization (Smart & Elton, 1982). Finally, faculty in multiple-paradigm disciplines are more likely to engage in student-centered teaching practices (Braxton, 1995) and produce significantly more student credit hours per FTE faculty member (Muffo & Langston, 1981) than faculty in single-paradigm disciplines.

In sum, there is strong empirical support validating differences between certain personality, teaching, and research characteristics for faculty in single- and multiple-paradigm disciplines. Research also shows that faculty are one of the strongest socialization agents influencing college outcomes (Pascarella & Terenzini, 1991). In light of this evidence, it appears crucial to examine whether the experiences of students in single- and multiple-paradigm disciplines differentially influence learning and development.

Disciplinary Differences in Gains in Communication and Critical Thinking Skills

Critical thinking and communication skills were selected as the learning outcomes to be examined in this research for two reasons. First, previous research revealed that certain multiple-paradigm disciplines place greater emphasis on communication and critical thinking skills than single-paradigm disciplines (Lattuca & Stark, 1995). Second, critical thinking skills and communication skills are commonly referred to as important learning outcomes for students in higher education (Glaser, 1985; LaFrancois, 1990; US Department of Education, 1991; Study Group on the Conditions of Excellence in American Higher Education, 1984).

Contrary to some studies (Davison, Rest, Thoma, & Welfel, 1981; King, Wood, and Mines, 1990; Simon and Ward, 1974; Terenzini, Springer, Pascarella, & Nora, 1995; Welfel, 1982; Welfel & Davison, 1986), there is evidence that academic major may be a factor related to gains in critical thinking skills. Astin (1993) found that majoring in education and fine arts had a negative influence on self-reported growth in critical thinking and/or analytical and problem-solving skills. In contrast, majoring in

engineering and physical science had a positive effect on self-reported growth in analytical and problem-solving skills (Astin, 1993). Concurring with Astin, Simon and Ward (1974) found that science students who were in their final degree year performed significantly better than art students who were in their final degree year on the inference subtest of the Watson-Glaser Critical Thinking Appraisal. King, Wood, and Mines (1990) found that graduate level social science majors had significantly higher scores on the Reflective Judgment Instrument than graduate level mathematical science majors. Using a more specific critical thinking task, Kalichman (1987) examined the relationship between students' majors and their knowledge of the concept that liquids remain invariantly horizontal. Perhaps not surprising, results of Kalichman's (1987) study showed that science majors performed significantly more accurately than arts majors.

Contrary to the many studies focusing on critical thinking skills, only one study was found which examined disciplinary differences for gains in communication skills. Using a national sample, Astin (1993) found that majoring in education, engineering, health professions, and physical sciences had a negative influence on self-reported growth in public speaking, writing, and/or listening skills. In contrast, majoring in humanities, psychology, and other social sciences had a positive influence on students' self-reported growth in writing and/or listening skills.

In sum, evidence regarding the role of academic discipline in the development of critical thinking skills is equivocal, while evidence regarding the role of academic discipline in the development of communication skills is quite sparse. Careful examination of the above studies revealed that existing literature quite often excludes sufficient variables to adequately portray disciplinary differences. Such variables include academic integration and social integration as well as a number of specific experiences unique to each major such as quality of teaching, quality of curriculum, and quality of advising.

With one exception (Astin, 1993), the literature also disregards students' perceptions of their educational development. Research shows that two people with equal knowledge and skills may perform differently depending on their self-perceptions of their abilities (Bandura, 1993). Because learning

environments influence students' self-perceptions (Bandura, 1993; Pascarella & Terenzini, 1991), research using students' self-perceptions of their development in critical thinking and communication skills abilities is vital to understanding how specific disciplines differentially influence learning and development.

Finally, rarely is structural equation modeling used to study the effects of students' experiences in the major on their self-perceived gains in communication and critical thinking skills. Structural equation modeling allows for the decomposition of correlations into direct and indirect effects. An indirect effect is the effect of one variable on another mediated through one or more intervening variables (Hoyle, 1995). Thus, structural equation modeling is able to provide a more complete quantitative analysis than chi-square, regression, and analysis of variance.

PURPOSE OF THE STUDY

To better understand the influence of disciplinary differences on learning, the present study aims to fill a void in the current literature by (1) including experiences in the major in addition to student background characteristics and general college experiences, (2) using student self-perceptions of their development in critical thinking and communication skills, and (3) using structural equation modeling in order to examine the influence of disciplinary differences on self-perceived gains. Specifically, the purpose of this study is to identify similarities and differences influencing students' self-perceived gains in communication and critical thinking skills for students in single- and multiple-paradigm disciplines.

The research questions addressed in this study are: (1) What background characteristics, experiences in the major, and college experiences differ in terms of explaining self-perceived gains in communication and critical thinking skills for students in single- and multiple-paradigm disciplines? and (2) How well does the proposed theoretical model explain self-perceived gains in communication and critical thinking skills for students in single- and multiple-paradigm disciplines?

METHODOLOGY

Participants

The sample for this study consisted of senior students enrolled for the 1995-1996 academic year at a midwestern, research I university. During the Winter 1996 semester, the Senior Survey (Student Life Studies, 1996) was administered to approximately 3,000 students who had completed 90 or more credit hours. The Senior Survey is a self-report instrument designed to measure how the college experiences of seniors influence educational success. After the initial mailing, a postcard reminder, and a second follow-up mailing, the total response rate was approximately 40%. As required by the research method, surveys with any missing data were deleted from the sample. Students who had not declared a specific degree program were also deleted from the sample, resulting in a final sample size of 694 students. The sample size for path analysis should include a minimum of 200 participants and there "should be a ratio of at least 5 subjects for each parameter to be estimated" (Hatcher, 1994, p. 149). The number of parameters (the sum of the path coefficients, variances, and covariances) to be estimated in this study is 53, therefore the sample size for this study is considered fairly large.

Of the participants, 58.5% were females and 41.5% were males. In contrast, 46.2% and 53.8% of non-participants were female and male, respectively. Chi-square analysis showed that the difference between participants and non-participants regarding gender was statistically significant at 0.01 level. However, the difference accounted for only 1.1% of the variance. Approximately 93% of the participants were Caucasian while 6.1% of the participants were minority students (1.4% were classified as missing/other). Of the non-participants, 82.1% were Caucasian and 9% were minority students (8.9% were classified as missing/other). Chi-square analysis showed that the difference between participants and non-participants regarding ethnicity was statistically significant at the .001 level. However, the difference accounted for only 1.8% of the variance. Participants tended to have higher ACT Composite scores. The mean ACT Composite score for participants was 25.68, while the mean score for non-participants was

25.06. Analysis of variance showed that the difference between participants and non-participants regarding ACT Composite score was statistically significant at 0.01 level. The difference accounted for only 0.5% of the variance.

Theoretical Model

A theoretical model of self-perceived gains in critical thinking and communication skills is displayed in Figure 1. This perspective on gains in critical thinking and communication skills was derived from research on academic and social integration (Tinto, 1975) and students' experiences in their majors. In the model, lines with one-way, directional arrows show the hypothesized effects between constructs (See Figure 1). In order to simplify the visual representation of the model, correlations among constructs at each level in the model are not shown (Eimers & Pike, 1997).

[Insert Figure 1. about here]

The theoretical model proposes that the extent to which students become integrated into the academic and social lives of the campus (academic and social integration) directly influences self-perceived gains in critical thinking and communication skills. This effect is consistent with research showing that greater academic and social integration results in greater learning outcomes (Pascarella & Terenzini, 1991; Terenzini & Wright, 1987).

Academic and social integration are directly influenced by experiences in the major (quality of teaching, quality of curriculum, quality of advising, and quality of lower-division courses) and student background characteristics (ACT Composite score and gender). Experiences in the major and student background characteristics are also hypothesized to directly influence self-perceived gains in critical thinking and communication skills. Finally, the model postulates that student background characteristics and experiences in the major will indirectly influence self-perceived gains in critical thinking and

communication skills; indirect effects are mediated through academic and social integration. Support for the above propositions is provided by Astin (1993b), Eimers and Pike (1997), Pascarella and Terenzini (1991), and Pike, Schroeder, and Berry (1997).

Measures

ACT Composite score. ACT Composite scores were drawn from institutional records to measure each student's entering ability. At this institution, ACT Composite scores are used in admission decisions and they are an important factor in predicting students' future academic performance.

Quality of teaching in the major. A composite score for quality of teaching in the major was computed by calculating the weighted mean (Armor, 1974) of six Likert-type items on the Senior Survey. These items were developed and used at the University of Tennessee-Knoxville (Van Liere & Lyons, 1986) to measure students' perceptions of program quality. These six items assessed areas such as the fairness of grading in major courses, quality of instruction in upper-division courses, competence of faculty, and the overall quality of one's department. The alpha reliability for quality of teaching in the major was .85.

Quality of curriculum in the major. A composite score for quality of curriculum in the major was computed by calculating the weighted mean (Armor, 1974) of eight Likert-type items on the Senior Survey. The eight items, developed and used at the University of Tennessee-Knoxville (Van Liere & Lyons, 1986), related directly to a student's major and evaluated areas such as the quality of courses in preparing students for employment, organization of curriculum in the major, quality of internship experiences, and clarity of degree requirements. The alpha reliability for quality of curriculum in the major was .81.

Quality of advising in the major. A composite score for quality of advising in the major was computed by calculating the weighted mean (Armor, 1974) of five Likert-type items on the Senior Survey. The five items, again from surveys used at the University of Tennessee-Knoxville (Van Liere & Lyons, 1986), assessed areas related to a student's major such as availability of one's advisor, appropriateness of

referrals to campus resources by one's advisor, quality of curricular advising, and quality of career advising. The alpha reliability for quality of advising in the major was .86.

Quality of lower-division courses in the major. A composite score for quality of lower-division courses in the major was computed by calculating the weighted mean (Armor, 1974) of four Likert-type items on the Senior Survey. The four items, also from surveys used at the University of Tennessee-Knoxville (Van Liere & Lyons, 1986), assessed areas such as the quality of instruction in lower-division courses, adequacy of preparation in lower-division courses for upper-division courses, and quality of courses for providing a good general education. The alpha reliability for quality of lower-division courses in the major was .74.

Gender. Gender was drawn from institutional records and was coded 1 for female and 0 for male.

Academic integration. A composite score for academic integration was computed by calculating the weighted mean (Armor, 1974) of five Likert-type items on the Senior Survey. The five items, developed by Donovan (1984) and Cabrera (1992), evaluated the extent to which students were interested in and worked on their studies and whether they were satisfied with their academic experiences. The alpha reliability for academic integration was .67.

Social integration. A composite score for social integration was computed by calculating the weighted mean (Armor, 1974) of five Likert-type items on the Senior Survey. The five items, developed by Donovan (1984) and Cabrera (1992), evaluated whether it was easy to make friends at college, whether students spent their spare time on campus, and whether students were satisfied with their social experiences. The alpha reliability for social integration was .70.

Self-perceived gains in critical thinking skills. A composite score for self-perceived gains in critical thinking skills was computed by calculating the weighted mean (Armor, 1974) of three Likert-type items on the Senior Survey. The items, drawn from University of Missouri-Columbia Freshman Survey (Eimers & Pike, 1997), evaluated student's perceived gains in skills related to higher-order synthesis and

evaluation such as thinking analytically and problem solving. The alpha reliability for self-perceived gains in critical thinking skills was .89.

Self-perceived gains in communication skills. A composite score for self-perceived gains in communication skills was computed by calculating the weighted mean (Armor, 1974) of seven Likert-type items on the Senior Survey. The seven items, drawn from Tennessee Alumni Survey (Pike, 1990) and used in the University of Missouri-Columbia Freshman Survey (Eimers & Pike, 1997), assessed student's perceived gains in written, oral, and interpersonal skills such as writing and speaking clearly and effectively and working cooperatively in a group. The alpha reliability for self-perceived gains in communication skills was .89.

DATA ANALYSIS

For the purposes of this study, Biglan's (1973a) typology was used to classify students into single- or multiple-paradigm disciplines. Of the 694 students included in the research, 270 were classified as majoring in single-paradigm disciplines and 424 were classified as majoring in multiple-paradigm disciplines. Regarding gender, chi-square analysis showed that the difference between single-paradigm (50.4% female, 49.63% male) and multiple-paradigm disciplines (63.7% female, 36.3% male) was statistically significant at 0.01 level. However, the difference accounted for only 1.7% of the variance. Regarding ethnicity, chi-square analysis showed that the difference between single-paradigm (5.6% minority, 93% Caucasian, and 1.5% other/missing) and multiple-paradigm (6.4% minority, 92.2% Caucasian, and 1.42% other/missing) disciplines was not statistically significant. Regarding ACT Composite score, analysis of variance showed that the difference between single-paradigm (26.4) and multiple-paradigm (25.2) students was statistically significant at 0.01 level. The difference accounted for 2.6% of the variance.

Following the research method used by Kasworm and Pike (1994) and Eimers and Pike (1997), multi-group structural equation modeling was used to determine whether relationships among variables in the hypothesized model were similar or different for students in single- and multiple-paradigm disciplines. Structural equation modeling was chosen as the appropriate procedure for testing the hypothesized relationships specified in the model for two reasons. First, it forces the researcher to construct a theoretically-based causal ordering of the variables in the model. Such explicit theoretical frameworks are often unnecessary or disregarded when statistical methodologies other than structural equation modeling are used (Wolfle, 1985). Second, it allows the researcher to examine direct, as well as indirect, influences on the dependent variable (Pascarella, 1985; Wolfle, 1985).

Analysis began by specifying all structural equations in the model as invariant (identical) across the two groups; however, the correlations among variables at the same level were free to vary (Kasworm & Pike, 1994; Eimers & Pike 1997). For example, the effect parameters for factors influencing social integration were identical for the single- and multiple-paradigm disciplines, while the relationship between academic integration and social integration was free to vary across the two groups. Analysis was conducted using the LISREL 8 computer program (Joreskog & Sorbom, 1993).

The chi-square statistic and goodness of fit index were used to determine whether the model accurately represented the data for the two groups of students. A nonsignificant chi-square statistic indicates that the model accurately represents the data for students in both single- and multiple-paradigm disciplines. A statistically significant chi-square indicates that certain relationships among variables in the model may differ for students in single- and multiple-paradigm disciplines. The goodness of fit index was used as a second measure of model fit. As a general rule, a goodness of fit index equal to or above .90 indicates that the model accurately represents the data for both groups.

If the chi-square and goodness of fit index indicate that the data do not accurately fit the model for both groups, then freeing parameters for a given structural equation will improve the model fit. Freeing the parameter for a given structural equation allows the two groups (single- and multiple-paradigm disciplines)

to differ on a specific relationship. If specific parameters are allowed to vary, a statistically significant chi-square change statistic indicates that freeing the parameter improved the model fit; a nonsignificant chi-square change statistic indicates that freeing the parameter did not improve the model fit. Once the most appropriate model was identified for both groups in this study, common metric standardized parameter estimates were evaluated to determine the relative strength of each variable in the model.

RESULTS

The chi-square for the invariant model in this study was 87.59 ($p = .17$) and the goodness of fit index was .97. Thus, there were no significant differences between the factors that explained self-perceived gains in critical thinking and communication skills for students in single- and multiple-paradigm disciplines. For both groups of students, the hypothesized model accounted for a substantial amount of variance in both communication and critical thinking skills. Overall, the variables in the model accounted for 25.3% of the variance in communication skills and 13.5% of the variance in critical thinking. The standardized effect parameters, indicating the relative strength of a variable's effect in the model, are discussed below (See Table 1).

[Insert Table 1 about here]

Academic Integration

The first structural equation in the model examined the influence of student background characteristics and experiences in the major on the degree to which students became integrated into the academic community of the university (academic integration). The most important variables influencing academic integration were quality of lower-division courses (.22) and quality of teaching in the major (.21).

ACT Composite score (.12) and gender (.12) also significantly and positively influenced academic integration. The gender effect revealed that females reported greater academic integration than did males.

Social Integration

The second structural equation in the model tested the influence of student background characteristics and experiences in the major on the degree to which students became integrated into the social community of the university (social integration). Surprisingly, quality of the curriculum in the major (.18) was the only variable to significantly influence social integration.

Critical Thinking Skills

The third structural equation in the model examined the influence of student background characteristics, experiences in the major, academic integration, and social integration on self-perceived gains in critical thinking skills. Self-perceived gains in critical thinking were significantly and directly influenced by academic integration (.19), the quality of lower-division courses (.17), social integration (.16), and gender (-.08). The gender effect revealed that females reported lower gains in critical thinking than males. Mediated through academic integration, self-perceived gains in critical thinking were indirectly and significantly influenced by ACT Composite score (.02), quality of lower-division courses (.03), and quality of teaching (.05). Mediated through social integration, self-perceived gains in critical thinking were indirectly and significantly influenced by quality of the curriculum (.04).

Communication Skills

The fourth structural equation in the model examined the influence of student background characteristics, experiences in the major, academic integration, and social integration on self-perceived gains in communication skills. The variable with the greatest direct influence on self-perceived gains in communication skills was social integration (.30), followed by quality of teaching (.13) and quality of

lower-division courses (.13), academic integration (.11), and ACT Composite score (-.09). Self-perceived gains in communication skills were indirectly influenced by quality of the curriculum (.06), mediated through social integration, and quality of teaching (.05), mediated through academic integration.

LIMITATIONS

The results of this study offer insights into certain college experiences that influence student learning and development. However, there are several limitations that must be recognized. First, since this study was performed with data from a single university, the results may not generalize to other institutions. Second, the participants used in this study differed slightly from the non-participants on gender composition, ethnicity composition, and ACT Composite score. Although the differences between participants and non-participants were quite small in practical terms, the participants may not exemplify the entire senior cohort. Third, the items on the Senior Survey were only a sample of all possible items that characterized the constructs measured in this study. Further investigations could reveal additional factors that influenced self-perceived gains in communication and critical thinking skills if different measures were used.

DISCUSSION AND CONCLUSIONS

One of the primary assertions tested in this study was that experiences in single- and multiple-paradigm disciplines differentially influence self-perceived gains in critical thinking and communication skills. Based on previous research (Biglan, 1973a, 1973b; Braxton, 1995; Smart & Elton, 1982; Smart & Ethington, 1995; Lattuca & Stark, 1995), one might expect students in multiple-paradigm disciplines to report greater gains in learning than students in single-paradigm disciplines. Contrary to this expectation, the student background characteristics and college experiences examined in this research influenced

multiple-paradigm disciplines. Perhaps the expected differences between single- and multiple-disciplines were mitigated by students' exposure to a variety of general education classes, which are typically taken in the freshman and sophomore years. In fact, of the experiences in the major examined in this study (quality of teaching, curriculum, advising, and lower-division courses), the variable most highly associated with self-perceived gains in critical thinking and communication skills was quality of lower-division courses. Thus, the equalities between self-perceived learning in critical thinking and communication skills for single- and multiple-paradigm disciplines may be due to the strength of lower-division, general education classes.

Most disconcerting among the results of this study is that quality of advising had no substantial influence on any variables in the model. Research shows that an effective advisor is one who assists students in becoming part of the educational environment (Metzner, 1989). Thus, one might postulate that the relationship between advising and self-perceived gains in communication and critical thinking skills is direct and/or indirect, mediated by academic integration. This study, however, failed to confirm such a premise. One possible explanation is that students did not take advantage of the information that an advisor had to offer. Or, perhaps the academic advising system could be strengthened to enhance student learning. Statistically, the model may be improved if quality of advising were removed. However, the theoretical and practical importance of advising to the undergraduate curriculum warns against the removal of this variable from the model. Instead, because academic advising is considered a relevant aspect of the college experience, its lack of influence requires more in-depth study.

The student background characteristics examined in this study implied distinct ways in which gender and academic aptitude, as measured by ACT Composite score, were related to self-perceived gains in communication and critical thinking skills. Mediated through academic integration, ACT Composite score positively influenced self-perceived gains in critical thinking: higher ACT Composite scores were associated with greater academic integration which, in turn, was related to greater self-perceived gains in critical thinking skills. Interestingly, however, ACT Composite scores were directly and negatively associated with self-perceived gains in communication skills: higher ACT Composite scores were related to

lower self-perceived gains in communication skills. One possible explanation for this result is that students with high ACT Composite scores might have been more involved in academic activities and less involved in social activities. Students who socialized less might have missed out on experiences that enhanced communication skills. Or, perhaps the statistics exemplify a ceiling effect in which students with high ACT scores came to college with such proficient communication skills that there was very little room for improvement.

Gender was significantly related to self-perceived gains in critical thinking skills, but not to self-perceived gains in communication skills. The influence of gender on self-perceived gains in critical thinking skills was direct, but negative; suggesting that females reported fewer gains in critical thinking skills. These results contradict the finding of Terenzini and colleagues (1995) that gender was not significantly related to gains in critical thinking. Furthermore, in light of the model presented in this research, the gender effect is contrary to one's expectations. Since academic integration was the most important variable influencing self-perceived gains in critical thinking skills and females reported significantly higher levels of academic integration, one might expect females to also report greater gains in critical thinking. On the contrary, females reported significantly lower gains in critical thinking than males. Perhaps these results exemplify a low self-concept of females in the area of cognitive gains or perhaps females are simply more modest in their self-reporting of gains. Regardless, future research is needed in order to explain the apparent gender disparity in self-reported gains in critical thinking skills.

A strong relationship between academic and social integration and student learning was revealed in the present study. In fact, two of the indirect effects in the model were larger than the direct effects (e.g., teaching on critical thinking and curriculum on communication skills); thus emphasizing the importance of academic and social integration as mediators for achieving student outcomes in higher education. Interestingly, social integration had the greatest influence on communication skills, while academic integration had the greatest influence on critical thinking skills. The significant impact of social integration on communication skills indicates that out-of-class experiences are vital aspects of student learning and

development. Realistically, students spend approximately 15 hours per week in the classroom; thus, extracurricular activities, living in a residence hall, and interactions with faculty and peers are but a few out-of-class experiences that can provide educational opportunities from which students can learn and develop. As evidenced by prior research, "out-of-class experiences presented students with personal and social challenges, encouraged them to develop more complicated views on personal, academic, and other matters, and provided opportunities for synthesizing and integrating material presented in the formal academic program " (Kuh, 1995, p. 146).

In his book, Achieving Educational Excellence, Astin (1987) suggests that students should be asked "their satisfaction with ... the quality of teaching, advising, curriculum, ... [and] extracurricular activities" (p. 170). In the present research, students' answers to such questions led to invaluable assessment results. It has been suggested that multiple-paradigm disciplines, more so than single-paradigm disciplines, tend to embrace practices that engender critical thinking and communication skills in students (Braxton, 1995). The findings of this study, however, do not support such findings. Instead, the salient component of this research was that quality of lower-division courses appeared to mitigate paradigm specific differences. For professors and college administrators, the results of this study underscore the importance of congruence between institutional goals and pedagogical practices that emphasize the importance of lower-division courses as a foundation for skills needed for future success. In conclusion, this research presents evidence that providing high quality experiences in the major and fostering an environment that is conducive to academic and social integration will ultimately lead to student learning.

REFERENCES

Armor, D. J. (1974). Theta reliability and factor scaling. In H. L. Costner (ed.), Sociological Methodology 1973-1974 (pp. 17-50). San Francisco: Jossey-Bass.

Astin, A. (1987). Achieving educational excellence. San Francisco: Jossey-Bass.

Astin, A. W. (1993). What matters in college? Four critical years revisited. San Francisco: Jossey-Bass.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. Educational Psychologist, 28(2), 117-148.

Berdie, R. (1967). A university is a many faceted thing. Personnel and Guidance Journal, 45, 768-775.

Biglan, A. (1973a). The characteristics of subject matter in different academic areas. Journal of Applied Psychology, 57(3), 195-203.

Biglan, A. (1973b). Relationships between subject matter characteristics and the structure and output of university departments. Journal of Applied Psychology, 57 (3), 204-213.

Braxton, J. M. (1995). Disciplines with an affinity for the improvement of undergraduate education. In N. Hativa & M. Marincovich (Eds.), New directions for teaching and learning: no. 64. Disciplinary differences in teaching and learning: Implications for practice (pp. 59-63). San Francisco: Jossey-Bass.

Cabrera, A. F., Castaneda, M. B., Nora, A., and Henstler, D. (1992). The convergence between two theories of college persistence. Journal of Higher Education 63 (2), 143-164.

Davison, M. L., Rest, J. R., Thoma, S. J., & Welfel, E. R. (1981). Final report higher education and cognitive-social development project. (Grant No. NIE-G-79-0021). Washington D. C: U. S. Department of Education.

Donovan, R. (1984). Path analysis of a theoretical model of persistence in higher education among low-income black youth. Research in Higher Education, 21 (3), 243-259.

Eimers, M. T., and Pike, G. (1997). Minority and nonminority adjustment to college: Differences or similarities? Research in Higher Education, 38 (1), 77-97.

Glaser, E. M. (1985). Critical thinking: Educating for responsible citizenship in a democracy. National Forum: Phi Kappa Phi Journal, 65 (1), 24-27.

Hatcher, L. (1994). A step-by-step approach to using the SAS system for factor analysis and structural equation modeling. Cary, NC: SAS Institute.

Hoyle, R. H. (1995). The structural equation modeling approach: Basic concepts and fundamental issues, In R. H. Hoyle (Ed.). Structural equation modeling: Concepts, issues, and applications (pp. 1-15). Thousand Oaks, CA: Sage Publications.

Joreskog, K. G., & Sorbom, D. (1993). Windows LISREL 8.03. Chicago: Scientific Software International.

Kalichman, S. C. (1987). Water running-up-hill: A closer look at sex differences in perceiving the invariant horizontality of liquids. Paper presented at the Annual Meeting of the Southeastern Psychological Association, Atlanta, GA.

Kasworm, C. E., and Pike, G. (1994). Adult undergraduate students: Evaluating the appropriateness of a traditional model of academic performance. Research inHigher Education 35, 689-710.

King, P. M., Wood, P. K., & Mines, R. A. (1990). Critical thinking among college and graduate students. The Review of Higher Education, 13(2), 167-186.

Kuh, G. D. (1995). The other curriculum: Out-of-class experiences associated with student learning and personal development. Journal of Higher Education, 66(2), 123-155.

LaFrancois, H. A. (1990) Dear (CPA Firm): How do the skills of your new-graduate accountants match the skills you need? Journal of Career Planning and Employment, 51 (1), 71-73.

Lattuca, L. R., & Stark, J. S. (1995). Modifying the major: Discretionary thoughts from ten disciplines. The Review of Higher Education, 18(3), 315-344.

Metzner, B. S. (1989). Perceived quality of academic advising: The effect on freshman attrition. American Educational Research Journal, 26(3), 422-442.

Muffo, J. A., & Langston, I. W. (1981). Biglan's dimensions: Are the perceptions empirically based? Research in Higher Education, 15(2), 141-159.

Pascarella, E. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. In J. C. Smart (ed.), Higher education: Handbook of theory and research, Vol. 1 (pp. 1-61).

Pascarella, E. T. (1989). The development of critical thinking: Does college make a difference? Journal of College Student Development, 30, 19-26.

Pascarella, E., and Terenzini, P. (1991). How college affects students: Findings and insights from twenty years of research. San Francisco: Jossey-Bass.

Pike, G. R. (1990). Dimensions of alumni perceptions of cognitive and affective growth during college. Paper presented at the American Educational Research Association annual meeting, Boston, MA.

Pike, G., Schroeder, C. and Berry, T. (1997). Enhancing the educational impact of residence halls: The relationship between residential learning communities and first-year college experiences and persistence. Journal of College Student Development, 38(6), 609-621.

Simon, A., Ward, L. O. (1974). The performance on the Watson-Glaser critical thinking appraisal of university students classified according to sex, type of course pursued, and personality score category. Educational and Psychological Measurements, 34, 957-960.

Smart, J. C., & Elton, C. F. (1982). Validation of the Biglan model. Research in Higher Education, 17(3), 213-229.

Smart, J. C., & Ethington, C. A. (1995). Disciplinary and institutional differences in undergraduate education goals. In N. Hativa & M. Marincovich (Eds.), New directions for teaching and learning: no. 64. Disciplinary differences in teaching and learning: Implications for practice (pp. 59-63). San Francisco: Jossey-Bass.

Student Life Studies (1996). MU senior survey. University of Missouri-Columbia: author.

Study Group on the Conditions of Excellence in American Higher Education. (1984). Involvement in learning: Realizing the potential of American higher education. Washington D.C.: U.S. Government Printing Office.

Terenzini, P. T., Springer, L., Pascarella, E. T., & Nora, A. (1995). Influences affecting the development of students' critical thinking skills. Research in Higher Education, 36(1), 23-39.

Terenzini, P. T., and Wright, T. M. (1987). Influences on students' academic growth during four years of college. Research in Higher Education, 26 (2), 161-179.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. Review of Educational Research, 45(1), 89-125.

U. S. Department of Education. (1991). America 2000: An education strategy. Washington, D.C.: Author.

Van Liere, K. D., & Lyons, W. (1986). Measuring perceived program quality. In T. W. Banta (Ed.). Performance funding in higher education: A critical analysis of Tennessee's experience (pp. 85-94). Boulder, CO: National Center for Higher Education Management Systems.

Welfel, E. R. (1982). How students make judgments: Do educational level and academic major make a difference? Journal of College Student Personnel, 23(6), 490-496.

Welfel, E. R., & Davison, M. L. (1986). The development of reflective judgment during the college years: 4-year longitudinal study. Journal of College Student Personnel, ??, 209-216.

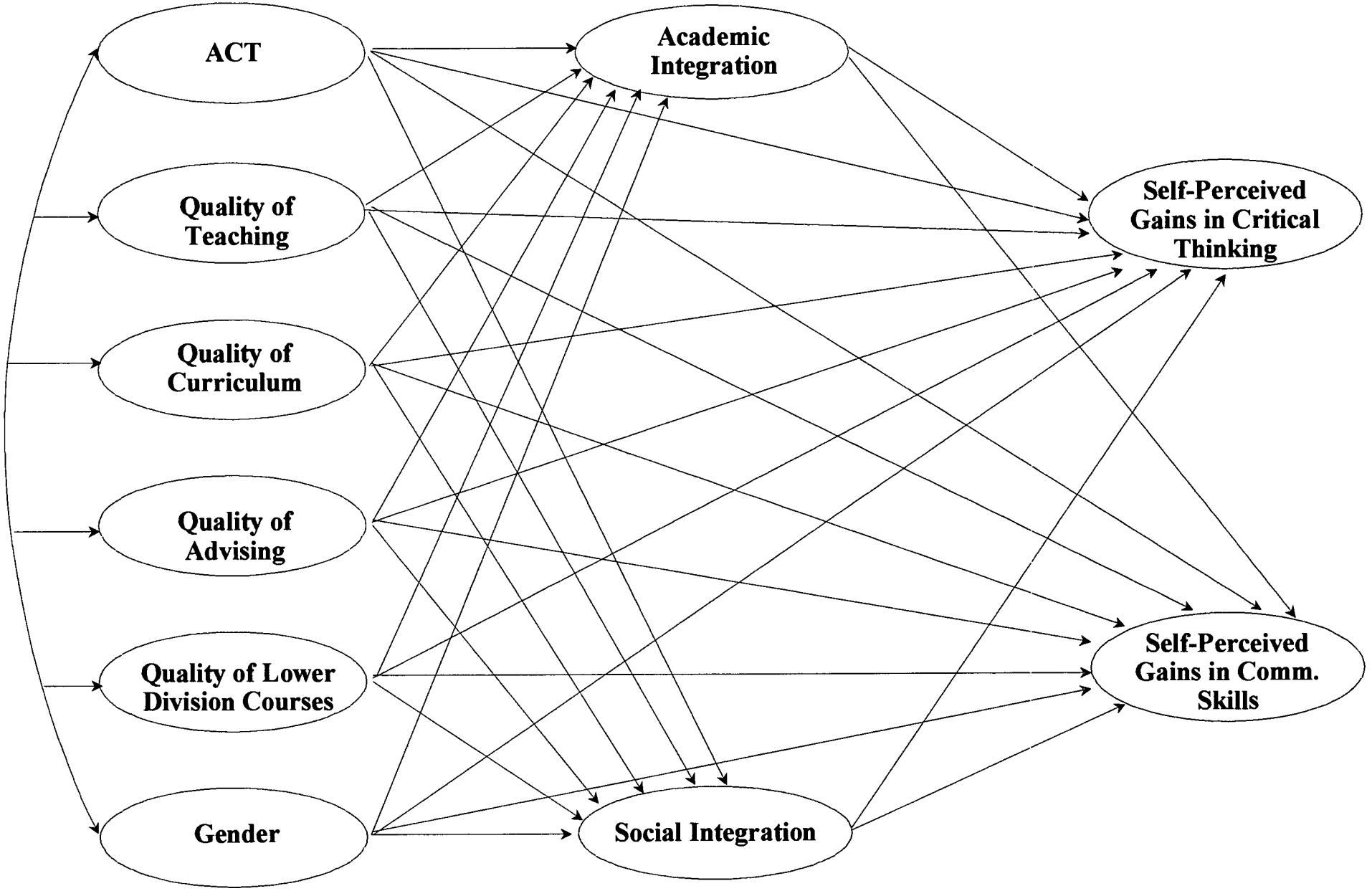
Wolfle, L. M. (1985). Applications of causal models in higher education. In J. C. Smart (ed.), Higher education: Handbook of theory and research, Vol. 1 (381-413). New York: Agathon.

Table 1. Standardized Effect Parameters

Effect	Direct	Indirect	Total
On Academic Integration			
Of ACT Composite	0.12***	---	0.12***
Of Quality of Teaching	0.21***	---	0.21***
Of Quality of Curriculum	0.04	---	0.04
Of Quality of Advising	-0.05	---	-0.05
Of Quality of Low. Div. Courses	0.22***	---	0.22***
Of Gender	0.12***	---	0.12***
On Social Integration			
Of ACT Composite	0.01	---	0.01
Of Quality of Teaching	0.08	---	0.08
Of Quality of Curriculum	0.18**	---	0.18**
Of Quality of Advising	0.01	---	0.01
Of Quality of Low. Div. Courses	-0.04	---	-0.04
Of Gender	-0.03	---	-0.03
On Critical Thinking			
Of Academic Integration	0.19***	---	0.19
Of Social Integration	0.16***	---	0.16
Of ACT Composite	0.02	0.02*	0.04
Of Quality of Teaching	-0.04	0.05**	0.01
Of Quality of Curriculum	0.08	0.04*	0.12
Of Quality of Advising	0.04	-0.01	0.03
Of Quality of Low. Div. Courses	0.17*	0.03*	0.20*
Of Gender	-0.08*	0.02	-0.06
On Communication Skills			
Of Academic Integration	0.11**	---	0.11
Of Social Integration	0.30***	---	0.30
Of ACT Composite	-0.09*	0.02	-0.07*
Of Quality of Teaching	0.13*	0.05*	0.18**
Of Quality of Curriculum	0.05	0.06**	0.11
Of Quality of Advising	0.03	0.00	0.03
Of Quality of Low. Div. Courses	0.13**	0.01	0.14**
Of Gender	0.00	0.00	0.00

Note. *p<.05, **p<.01, ***p<.001

Figure 1. Theoretical Model of Self-Perceived Gains in Critical Thinking and Communication Skills



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